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Report to AID on an NBS/AID Course on Weights and Measures Services

Edited by:

H. Steffen Peiser

Charles C. Raley

Albert D. Tholen

Office of International Relations
National Bureau of Standards
Washington, D.C. 20234

Held June 24 - July 14, 1978

Issued April 1979

The Course was conducted as a part of the program under the
US/NBS Agency for International Development

Prepared for

Agency for International Development

Department of State

Washington, D.C. 20523

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U.S. DEPARTMENT OF COMMERCE, Juanita M. Kreps, *Secretary*

Jordan J. Baruch, *Assistant Secretary for Science and Technology*

NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

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Left to right:

First row: Mr. Santosa, Ms. Corazon D. Herrera, Mr. Rafael Aguirre

Second row: Mr. Abderrahman Kilani, Ms. Ivonne Ruiz de Suarez,
Mr. Mohamed Benkirane, Mr. Patroba A. Ayata

Third row: Mr. Tweedsmuir Mitchell, Mr. Seok Mu Choi

Fourth row: Ms. Penelope M. Odar, Mr. Albert D. Tholen,
Dr. Edward L. Brady, Mr. Richard N. Smith

INTRODUCTION

On behalf of the National Bureau of Standards (NBS) and the Agency for International Development (AID), we present this report on the conduct of a "Course on Weights and Measures Services." This course was new and experimental in nature. Participants were intended to be, and were for the most part, heads of weights and measures laboratories in their own countries or senior technical specialists having major roles in metrology.

This training course on weights and measures services was held at NBS in Gaithersburg, Maryland. The emphasis was on practices in the States of the Union, which in the United States have regulatory control with technical advice from NBS through the National Conference on Weights and Measures (NCWM). The training program was designed for participants from less industrialized countries with technical and management responsibilities in this field.

The course, scheduled for the three-week period June 24-July 14, 1978, consisted of the following elements:

- 1) Overview of weights and measures activities at NBS, June 24-27, 1978.
- 2) In-depth visit to two State Weights and Measures Offices in nearby states, June 28-July 7, 1978.
- 3) Participation in the 63rd U.S. National Conference on Weights and Measures, Washington, D.C., July 10-13, 1978. The theme of this annual event was "Changing Dimensions and Directions in Measurement Assurance." Approximately 500 persons comprising state and local weights and measures regulatory offices, officials of Federal, State, and local governments, and representatives of manufacturers, industry, business, and consumer organizations were present, and numerous major topics were covered.
- 4) Summary and Evaluation Session on July 14, 1978.

Eleven persons attended this course.

Most participants prepared a brief paper on the approach to some weights and measures related system or problem in their home countries.

We appreciate the time and effort by the many NBS organizations which assisted us in this undertaking. Special thanks are in order for Mr. Wayne Junkins (Director of Bureau of Standard Weights and Measures in Pennsylvania) and Mr. James Lyles (Supervisor of Weights and Measures in Virginia), who hosted the course for three days in each state. The

idea for such a course had its genesis several years ago but was brought into sharp focus during the "NBS/AID/ASMO Survey of Standardization and Measurement Services in Sudan" in February and March 1978. We shared a strong belief that such a program followed up by tailored support to individual countries could be a logical way toward growth of measurement programs in developing nations.

The results of this course, considering the formal comments of the participants, as well as exchange of ideas in informal conversations, are being analyzed to:

- 1) Improve the content of the course for future sessions.
- 2) Develop relevant support programs for individual nations for consideration by NBS/AID and specific nations.

This report identifies the participants, their home countries, and, through a collection of short papers, their thoughts concerning their weights and measures programs at home. Additionally, the itinerary for the three-week period is presented to identify the nature of the sessions and demonstrations held. The program and substantive description of activities of the National Conference on Weights and Measures is available from the Office of Weights and Measures, National Bureau of Standards.

The Summary and Evaluation Section offers specific conclusions regarding the Course and suggested improvements. A summary of individual responses to a questionnaire is contained to reinforce these conclusions.

H. Steffen Peiser
Chief, Office of International Relations

Albert D. Tholen
Chief, Office of Weights and Measures

PARTICIPANTS
1978 NBS/AID COURSE ON
WEIGHTS AND MEASURES SERVICES

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National Bureau of Standards
Agency for International Development
COURSE ON WEIGHTS AND MEASURES SERVICES

June 24 - July 14, 1978

June 24, Saturday

AM - PM Arrive Gaithersburg, Maryland, U.S.A.

June 25, Sunday

AM - PM Free

June 26, Monday

Office of Weights and Measures
National Bureau of Standards
Washington, DC 20234
(301) 921-3677

Mr. A. D. Tholen, Chief

AM "Weights and Measures in the U.S.A."
Mr. R. N. Smith, Technical Coordinator, OWM

PM "U.S.A. Participation in OIML"
Mr. D. E. Edgerly, Chief, Office of Domestic
and International Measurement Standards

"National Conference on Weights and Measures"
Mr. H. F. Wollin, Assistant Chief, OWM

"OWM Prototype Program"
Mr. H. V. Oppermann, Physical Scientist, OWM

June 27, Tuesday

AM Tour of NBS Campus

PM "OWM Standards and Laboratory Program and Tour"
Mr. B. Keysar, Engineering Technician, OWM

"Interesting Engineering Projects"
Mr. S. Hasko, Engineer, OWM

"Metric Conversion in the U.S.A."
Mr. J. V. Odom, Metric Coordinator, OWM

"Commercial Measurement Challenges"
Dr. C. B. Brickencamp, Program Manager,
Research and Development, OWM

June 28, Wednesday

Bureau of Standard Weights and Measures
Department of Agriculture
Commonwealth of Pennsylvania
2301 N. Cameron Street
Harrisburg, PA 17120
(717) 787-9089

Host: Mr. W. F. Junkins, Director

AM

Introduction to the Department of Agriculture
Honorable K. D. Shelhamer, Secretary of Agriculture
Mr. W. F. Junkins, Director of Bureau of Standard
Weights and Measures

Slide Presentation on Weights and Measures
Activities in Pennsylvania, Mr. R. R. Roof,
Metrologist

Explanation of Weights and Measures Laws and
Regulations Enforced in Pennsylvania

1. National Bureau of Standards Handbook 44,
Specifications, Tolerances, and other Techni-
cal Requests for Commercial Weighing and
Measuring Devices, Mr. R. R. Roof
2. National Bureau of Standards Handbook 67,
Checking Prepackaged Commodities,
Mr. G. E. Carpenter, Metrologist
3. Weights and Measures Act of 1965,
Mr. D. F. Ely, District Supervisor
4. Packaging and Labeling Regulations,
Mr. D. F. Ely

PM

Tour of the State Capitol Building and the
William Penn Museum

Briefing and Explanation of Activities in the
Weights and Measures Laboratory, Messrs. Roof
and Carpenter

June 29, Thursday

AM - PM

Dairy in-plant inspection and tour of packaging facilities

Retail inspections consisting of testing various lots of commodities such as random meat, dairy and produce, dry standards such as breakfast cereals, and a liquid such as milk. The labeling of these commodities is explained and a selection of scales examined while at the store. The last stop is a retail gas station to conduct a routine pump examination. Messrs. Dellegratto, Ely, Goodhart

Visit Regional Office

Picnic Supper, Liddick Residence

June 30, Friday

AM

Review of Activities

Demonstration of the Testing of a Motor Truck Scale, Mr. T. Serovich, Inspector

PM

Remarks, Honorable K. D. Shelhamer

Administration of a Weights and Measures Program, Mrs. D. Liddick

Review and Discussion, Mr. W. F. Junkins

Visit Weights and Measures Laboratory

July 1, Saturday

AM - PM

Free

July 2, Sunday

AM - PM

Free

July 3, Monday

AM

Free

PM

Picnic Supper, Tholen Residence

July 4, Tuesday (Independence Day)

AM - PM Free

July 5, Wednesday

Weights and Measures Section
Division of Product and Industry Regulation
Department of Agriculture and Commerce
Commonwealth of Virginia
1 North 14th Street
Richmond, VA 23219
(804) 786-2476

Host: Mr. J. F. Lyles, Supervisor

AM Welcome and Remarks, Mr. S. M. Carbaugh,
Commissioner, Virginia Department of Agriculture
and Consumer Services

Welcome from the Governor, Commonwealth of
Virginia, Mr. M. B. Rowe, Secretary, Commerce and
Resources

Tour of Capitol Building

PM Discussion, Mr. J. F. Lyles, Supervisor, Weights
and Measures Section

July 6, Thursday

Group A

AM Petroleum Terminal, Mr. O. T. Almarode,
Field Supervisor

Witness Inspection of:
Vehicle Tank Meter, Mr. J. G. Sanders, Inspector
Bulk Plant Meter, Mr. T. H. Wood, Inspector
LPG Meter, Mr. G. E. Ferrell, Inspector

PM Iron and Metal Yard, Mr. O. T. Almarode

Witness Inspection of:
Railroad Track Scale, Vehicle Scale, Warehouse
Scale, Mr. R. A. Reese, Inspector

Group B

AM Food Store No. 1

Witness Inspection and Operation of:
UPC Weigher and Labeler
Digital Deli Scale
Electronic Cash Register/Scale at Check-Out
Random Weight Package Checkweighing

Food Store No. 2

Observe Operation of:
Mechanical Hanging Scales
Mechanical Cash Registers/Scales at Check-Out

PM Service Station No. 1

Witness the Inspection and Operation of:
Gas pump with digital indicating elements equipped
with remote readout

Service Station No. 2

Witness the Inspection of:
Retail motor fuel dispenser - single product
Retail motor fuel dispenser - blended product

Mr. R. H. Shelton, Field Supervisor, and
Mr. R. W. McDougle, Inspector

July 7, Friday

AM - PM Groups A and B Switch Itineraries of July 6

6:00 PM Farewell Reception, Stewart Residence

July 8, Saturday

AM - PM Visit Williamsburg, Virginia

July 9, Sunday

AM Free

PM 63rd National Conference on Weights and Measures
"Changing Dimensions and Directions in Measurement
Assurance"

July 10, Monday

AM - PM

July 11, Tuesday

AM - PM

July 12, Wednesday

AM - PM

July 13, Thursday

AM - PM

July 14, Friday

AM - PM

NCWM Conference program available from:

National Bureau of Standards
Office of Weights and Measures
Washington, D.C. 20234

Evaluation and Concluding Session at NBS

THE NATIONAL LABORATORY OF METROLOGY
IN ECUADOR

by

Mr. Rafael Aguirre
Chief, National Laboratory of Metrology
Instituto Ecuatoriano de Normalizacion
Quito, Ecuador

A. INTRODUCTION

The Instituto Ecuatoriano de Normalizacion (INEN) was established by Decree 357 on August 28, 1970, having as its principal responsibility the preparation and implementation of technical standards for national and international trade.

The Quality Control Program was implemented within a few years with the objective of certification of the quality of products or services, according to national or international standards.

The creation of the National Laboratory of Metrology, recognized by Official Act on March 22, 1973, marked the first step in our metrological activities, which have been conducted through the National Directorate of Weights and Measures, established at INEN by the Weights and Measures Law issued on January 9, 1974. This law established this Directorate as the national authority for metrology in Ecuador.

At present with its three technical Directorates--Standardization, Quality Control, and Metrology--INEN constitutes the main agency supporting technical development of industry and commerce in Ecuador by providing information, technical assistance, and specialized services.

B. FRAMEWORK

Following a conscientious study on the national metrological needs, the National Laboratory of Metrology started its activities within three main fields: mass, length, and volume.

This laboratory was designed and planned jointly by a group of experts from NBS together with Ecuadorian engineers. The procurement, calibration, and certification of the reference standards was conducted at NBS-Gaithersburg; they became the National Standards for Ecuador, this being the first step in the development of scientific metrology in our country. In the last two years, electrical standards have been established and have been used to support the continued and increased demand due to the important development experienced by the electronic industry in Ecuador.

Some activities in industrial metrology were initiated three years ago to satisfy the need for testing materials according to national or international standards, in order to certify the quality of products. This field is being reinforced with basic equipment purchased for dimensional measurements.

Legal metrology has been developed faster than the before mentioned metrological activities. This division with its own equipment and specialized personnel has been working since 1974 with two main objectives: to establish equity in the marketplace and to implement the SI Units in Ecuador. Both are very difficult to achieve due to: the inadequate and inaccurate measuring procedures; obsolete equipment which has been used by personnel belonging to the municipalities and government; and the various systems of units used in education, industry, and commerce for many years.

Figure 1 shows the present organization of the National Laboratory of Metrology, in which eight metrologists are working. The increasing demand of our services has not resulted in additional staffing.

C. SERVICES

The services are orientated towards the whole measurement activities carried out in educational centers, industry, commerce, and governmental agencies. A brief scope of these services in the different fields is as follows:

1. Scientific Metrology.

1.1 Calibration and Certification of Standards or equipment:

- a) Mass: Secondary and tertiary standards of mass which may be individual weights or sets of weights in the range of 1 mg to 1,000 kg.
- b) Length: Measuring tapes or rulers considered as tertiary standards and used as working standards in industry.
- c) Volume: Field standards including measuring flasks and provers in the range of 10 mL to 5,000 L.
- d) Electricity: Instruments for measuring AC, DC, and RF Voltage, AC and DC current and resistance. Electrical equipment such as resistance decade boxes, capacitors, inductances, voltage dividers, and voltage sources of DC and AC.

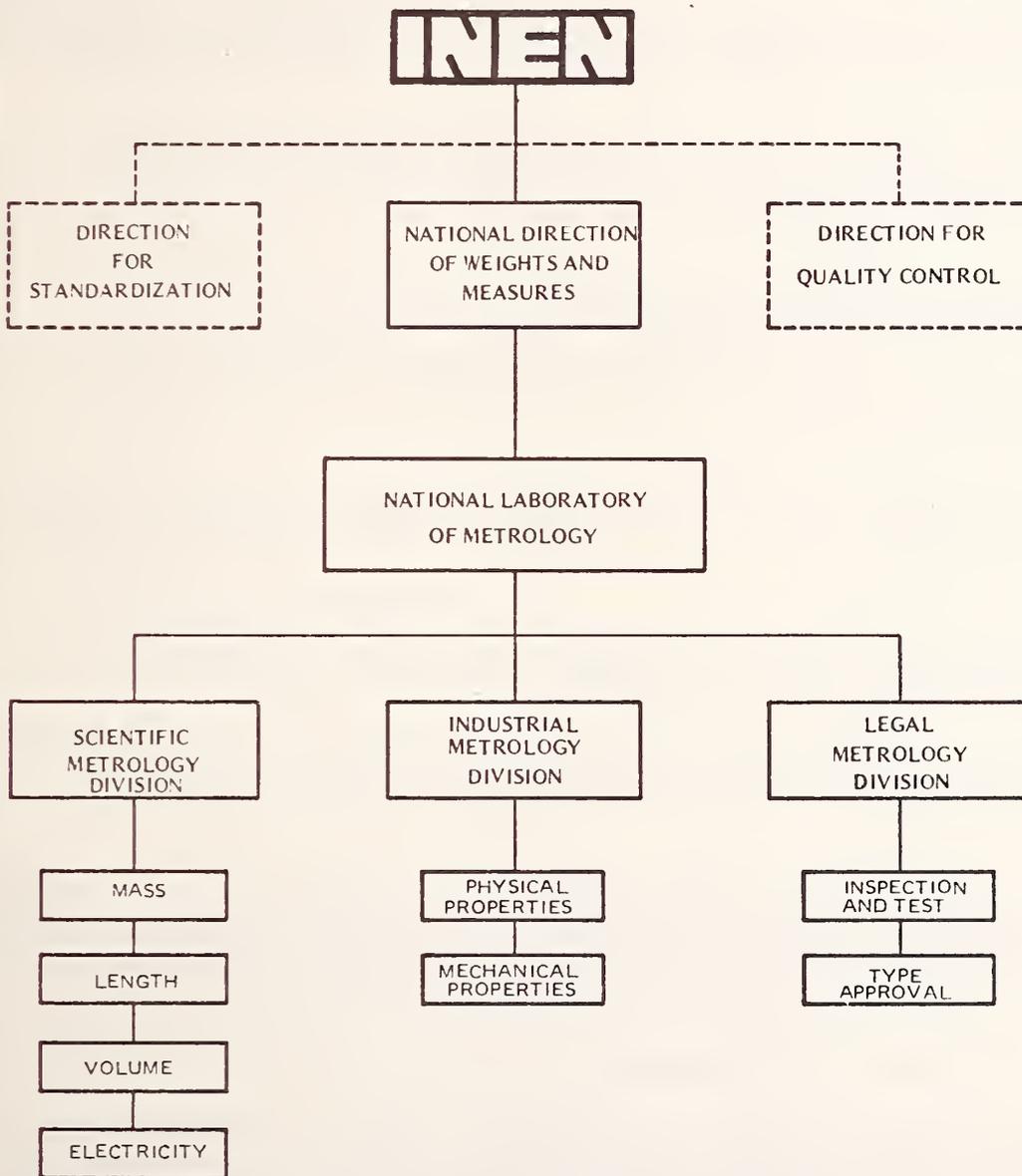


FIGURE 1. Structure of the National Laboratory of Metrology

1.2 Training courses in mass, length, and volume calibration techniques.

2. Industrial Metrology:

2.1 Measurement of physical properties of materials (mass, length, volume, density, surface finish).

2.2 Measurement of mechanical properties of materials (tension, compression, flexure, fatigue, hardness).

2.3 Calibration and certification of measurement equipment (gage blocks, calipers, micrometers) used in industry.

3. Legal Metrology:

3.1 Inspection, test and certification of weights, measures, elements, or equipment.

3.2 Type approval of weights, scales, measuring instruments, or equipment produced in Ecuador.

3.3 Technical assistance on packaging and labeling of products or commodities.

3.4 A general service constituted to act as technical consultant and supplier of specialized information within the weights and measures field. This service is supplied free to any person applying.

D. FIVE YEARS SERVICE EVALUATION

During the first two years, personnel of the National Laboratory of Metrology faced many difficulties caused by the lack of knowledge and training of personnel in the use of high precision equipment and, also, due to the use of different systems of units. The first goal was to write technical documents or national standards, establishing procedures on guidelines for calibration techniques and requirements, testing scales and packages, tolerances and specifications for weights and scales, etc.

During the early period (identified as a time for establishing credibility), it was necessary to develop a national plan of technical assistance to industry and commerce, in order to prove our capabilities and help them in solving their weights and measures problems. Additionally, this activity served to promote our services and to develop a close relationship with the main enterprises and government agencies.

This experience served to detect different problems, one of which (and surely the main problem demanding prompt action) was the shortage of trained personnel in the use, maintenance, and calibration of weights and measures equipment, especially laboratory scales, commercial and industrial scales, weights, volumetric provers, and length measures.

It was necessary to solve this problem by establishing training courses for the weights and measures authorities, laboratory staffs, and personnel devoted to the use or maintenance of measuring equipment.

In a short period, the following aspects were covered by the training courses:

- Ecuadorian Weights and Measures Law.
- Implementation of SI Units.
- Inspection and test of laboratory scales.
- Inspection and test of commercial and industrial scales.
- Inspection and test of gas pumps and flow meters.

Following this period, there was a notable increase in demand from commerce and industry for use of our services. Initially, the services of the National Laboratory of Metrology were free; now, due to INEN's limited budget, we are charging reasonable rates for the services. Many industries have signed contracts for periodical certification of their equipment by INEN.

These contracts are specially related to:

- Periodical certification of weights, laboratory scales, commercial and industrial scales, volumetric and length measuring equipment.
- Participation in the National Laboratory Auditing Program.
- Technical assistance in weights and measures.

One of the objectives is to achieve a satisfactory development of Ecuadorian industry, with equity in the marketplace and unrestricted and increasing technological development based on international standardization of our equipment resulting in confidence in measurements performed by the National Laboratory of Metrology. This will be accomplished by the participation of INEN through the National Laboratory of Metrology in the Inter-American Service of Metrology, which has the following main objectives:

- To establish the uniformity of our National Standards of Reference.
- To obtain uniformity in calibration techniques and procedures in order to assure the traceability and transference of measurements.

DELIVERY OF COOKING GAS TO JAMAICAN HOUSEHOLDERS

By

Mr. Tweedsmuir Mitchell
Acting Head, Weights and Measures Unit
Jamaican Bureau of Standards
Kingston, Jamaica, W.I.

BACKGROUND:

The Jamaican Bureau of Standards, which is the most advanced standards institution in the English-speaking Caribbean, was established under the Standards Act, 1968, to promote standardization in relation to commodities, processes, and practices. This organization is located in the densely populated capital, Kingston, which has just over a quarter of the island's two million inhabitants.

The Jamaican Bureau of Standards consists of six technical departments, one of which is the Regulations and Compliance Department under which falls the Weights and Measures Unit. The Bureau of Standards, through the Weights and Measures Unit, has the responsibility to administer the Weights and Measures Act, 1976, and the accompanying regulations. This responsibility formerly rested with the police under the Weights and Measures Law of 1890.

The Weights and Measures Unit was established and equipped for the purpose of ensuring that equity prevails in all commercial transactions involving quantity. The laboratory is equipped with, and maintains, a complete set of standards in both metric and imperial denominations. These are precision balances and working standards of mass, length, and volume, certified for accuracy by the National Physical Laboratory and the Department of Trade and Industry in Britain.

Among the activities being undertaken by the Unit is the in-plant check-weighing of filled L.P.G. cylinders to ensure that the consumer receives the correct quantity of gas. This program was undertaken as a consequence of numerous complaints by consumers about weight deficiencies.

INTRODUCTION:

In Jamaica at present, Liquefied Petroleum Gas (cooking gas) is sold to householders mainly in 100-lb and 30-lb capacity steel cylinders as well as 25-lb capacity aluminum cylinders. Filling is done by five companies, which receive their product from the local oil refinery. The price of Liquefied Petroleum Gas (L.P.G.) is controlled by Government.

At a typical filling plant, cylinders which are marked with tare weight (either at the factory or on entering the filling plant) are placed on scales which are an integral part of the filling system. Subsequent to a cylinder being placed on the scale, an allowance is made for the tare

weight, and the scale mechanism is set to trip whenever the required net weight of product has been added. For example, in the case of a 100-lb capacity cylinder with a tare weight of 70 lb, the scale is set to (70 + 100) lb; i.e., 170 lb. The tripping of the filling mechanism indicates to the operator that filling is complete. The operator then sends it on to the check scales or to dispatch, depending on the system in operation at the plant.

Some plants affix to each 100-lb cylinder a wire seal as a measure of protection to the consumer. This seal is designed to break when the valve is opened.

SITUATION PRIOR TO INVOLVEMENT OF WEIGHTS AND MEASURES UNIT:

The situation prior to the involvement of the Weights and Measures Unit is outlined below. Weight control at filling plants was done by the operators of the filling machines who check-weighed filled cylinders at random. However, their primary concern was to safeguard against over-filling in order that the companies did not lose product and hence revenue. Little attention was paid to cylinders which had weights well under the declared weight unless such deficiencies were very obvious. Scant regard was given to the servicing and accuracy of the scales. The presence of a scale serviceman at some filling plants was a rarity, and the presence of debris on the platforms of scales and in the immediate environment was commonplace. Most of the attention given to scales was a result of breakdown.

In most cases, no rigid tolerances were being observed. If such tolerances existed, it was very likely that these were on the positive side.

Meanwhile, the Unit received several complaints concerning short weight in filled cylinders, most of which were found to be valid after investigations were done.

INVOLVEMENT OF THE WEIGHTS AND MEASURES UNIT:

Given the situation just outlined, a decision was taken to implement a program of general appraisal. This included visits to the filling plants, observing delivery of filled cylinders, and the collection and documentation of consumer complaints. The Unit then began a monitoring system which involved:

- (a) Weighing of filled cylinders in trucks after they had been stopped.
- (b) Weighing of cylinders at the point of delivery to the consumer.

It was found that when weighing of cylinders was done on board any truck, only a small sample was obtained and so could not be said to

be truly representative of the batch. Another disadvantage was the time-consuming and tedious nature of the examination. These disadvantages outweighed any benefits derived from such an undertaking, and as a consequence, the exercise was discontinued.

The weighing of cylinders at the consumer's residence and in the presence of the consumer turned out to be another abortive attempt to protect the consumer. Ironically, it was found that very often the consumers were not interested, or were not at home when deliveries were made.

After encountering these multiple problems, this approach was discarded in favor of in-plant check weighing. In this program, a sampling plan was first circulated to operators of all filling plants. Inspectors, after being familiarized with the plan, paid frequent and unannounced visits to these plants.

During the visit to a particular plant, the platform scales (both filling scales and check scales) used for weighing cylinders were tested for accuracy by using certified test weights. These were either the property of the Unit or were weights belonging to the plant and which were certified by the Unit. These scales were usually tested at least to that point corresponding to the greatest gross weight of a cylinder.

The performance of these scales was recorded. Whenever large errors were discovered on a particular device, the supervisor was requested to cease using such and to deploy a substitute until the fault was rectified. Accurate devices were given verification stickers.

The scales having been tested, a random sample of filled cylinders was taken (in accordance with the sampling plan), and the net contents of each cylinder computed from the gross weight determined on the scale and the tare weight marked on the cylinder. Batches were then rejected or accepted as the sampling plan prescribes.

Later, the data recorded was statistically analyzed. On the basis of these observations and computations, recommendations were made to the companies concerned to maintain or to upgrade their weight control system if too large a percentage of net weight readings was outside the control limits. Some of the statistical data mentioned above were used in the derivation of these control limits.

The test procedure outlined above was carried out very frequently during the initial stages of this ongoing program, but as it became evident that the plant personnel were adhering to the sampling plan and were implementing it, the frequency of visits declined. At present each plant in Kingston is visited once monthly, and usually the batches from which the samples are drawn are accepted.

CONCLUSION:

Since the involvement of the Weights and Measures Unit, there has been a marked decrease in consumer complaints on the matter of short weight in filled cylinders.

Liquefied Petroleum Gas is currently being sold for just over \$27 per 100 lb, about 27¢ per lb. This cost is more than sufficient reason for weights and measures control.

Finally, it should be recognized that Jamaica was not the only developing country which encountered the problem of short-filled cylinders being sold to consumers. A few months ago, the Unit received a letter from a developing Central American country **in which the identical** problem was explained and advice sought from this organization. Information concerning the corrective measures to be taken was forwarded to the country involved. Later a response was received, stating that the information was of great help in their consumer protection drive.

The Jamaican Bureau of Standards has been quite successful in its attempts to ensure that the consumer receives the correct quantity of L.P.G. In addition, the knowledge that a responsible organization is working to ensure consumer protection has served to minimize the number of complaints which are received.

WEIGHTS AND MEASURES IN JORDAN

by

Mr. A. Kilani
Head, Weights and Measures Section
Directorate of Standards
Amman, Jordan

The Directorate of Standards consists of five divisions. Weights and measures is one of these divisions.

The Directorate activities in this field are aimed at establishing and operating a central standards laboratory and district weights and measures office to implement national metrological services and to effect the smooth transfer to the metric system. Studies revealed the following commendable achievements:

- (a) The smooth, almost completed changeover to the metric system in commerce, industry, and agriculture (except in minor, relatively unimportant areas of commerce, the metric system is used).
- (b) The successful scheme whereby the Ministry of Industry and Trade imported sets of metric weights in bulk for sale through the trade.

On the other hand, there were the following deficiencies:

- (a) Proper premises to maintain standards and to carry out metrological activities.
- (b) Any internationally authenticated physical standards for Jordan.
- (c) Adequate legal machinery to correct the above-mentioned defect.
- (d) Adequate facilities for maintaining physical standards as well as for carrying out metrological services.
- (e) The lack of formal training in metrology of the legal metrology staff, consisting of a university graduate chief and four inspectors only.
- (f) Essential transport for the inspectorate.
- (g) A proper recording and registration system for inspection and standards validation work.

Solutions to the above problems were sought during the U.N. project.

Equipment

The equipment consisted of:

- (a) A first-class invar meter bar of "H" section.
- (b) Several first-class sets (20 kg to 1 mg) of stainless steel standard weights of German origin.
- (c) A 200 g precision balance.
- (d) An excellent standard for capacity measures of tinned-iron.

Legislation

A thorough study of metrological legislation in Jordan revealed the necessity of effecting certain amendments.

The outstanding defect in the metrology provisions of Law No. 24/1972 is that no physical representations of the approved metric units are legalized. For a country's metrology administration to be internationally approved, it must possess physical standards which are given legal status in the metrology law. No such physical standards or legal provisions exist in Jordan, so the country is in an extremely weak position should the matter be raised in any international dealings. Internationally authenticated standards have been ordered by the Directorate and these should be legalized by appropriate provisions in the law.

Metrological Activities

A continuous program of inspection of weights was instigated; ring weights, non-metric weights, and other objectionable weights were seized.

All measures of length in use in cloth shops were tested and stamped; non-metric measures were seized. Stocks of new measures held by dealers were called into the office for testing and stamping, if correct.

A program of calibration and sealing of gasoline pumps was carried out in cooperation with Jordanian Petroleum Refinery Company (JPRC). Surprise inspections were carried out from time to time on heating oil vendors, gasoline pumps, etc. The measures used by kerosene sellers were checked on a random basis, and stocks of new kerosene measures, submitted by sellers, were tested and stamped.

Draft outline specifications were made for weights, counter machines, platform machines, weighbridge, length measures, gas pumps, and bulk liquid fuel meters.

In addition to the duties set out in the work plan, division personnel were requested to assist in the preparations being made for the enforcement of the Precious Metals Act as well as with a new activity, namely, the calibration, testing, and sealing of taximeters.

Concerning the hallmarking of precious metals, a comprehensive study of the trade in such metals was carried out in Amman, Zarqa, Irbid, and Aqaba, and the findings transmitted to the Government. Also, stamps for gold, silver, and platinum marking have been designed and potential suppliers contacted.

As regards taximeters, a system for verification was established and the inspectorate thoroughly trained for this job so that they were capable of calibrating, testing, and sealing the meters to be installed in taxis in the Amman District.

METRICATION IN KENYA

by

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In 1963 the three Governments of Kenya, Uganda, and Tanzania decided that the time was ripe for the introduction of the metric system of weights and measures in East Africa. A Special Commission, the East African Metric Commission, was therefore set up to advise on whether the change should be made and to make recommendations on how it should be done.

Following the recommendations of the Metric Commission, the three Governments of the former East African Community made simultaneous announcements of their intention to adopt the metric system since the system was internationally accepted and most countries of the world who were not already using the system were preparing to change over. A phased program for the change, based on a five-year period, was worked out; and a Standing Committee on the Metric System and Bureau of Standards composed of officials from the three countries was set up to supervise the changeover throughout East Africa.

PUBLICITY:

To prepare the public for the change, a rigorous publicity campaign was mounted. The aims of the campaign were:

- (a) To familiarize the public with the new units of measurement.
- (b) To facilitate an early grasp of the physical values of the commonly used units, i.e., the kilogram, meter, liter, kilometer, etc.
- (c) To promote understanding of the multiples and sub-multiples of the new system.
- (d) To familiarize the public with the sizes and mass of everyday things in various activities in the new units of measurements.
- (e) To promote the acceptance of the new system.

During a publicity campaign, sustained efforts were made to utilize various communication media to the maximum extent possible. Press notes were released to newspapers, magazines, journals, etc.,

explaining various aspects of metrication with the intention of generating metric consciousness. Documentary films explaining the advantages of the metric system were also prepared and exhibited to the public; metric literature such as pamphlets, brochures, and handbooks were published and distributed freely; conversion tables and price charts were also prepared and widely circulated; outdoor and indoor publicity was carried out in such places as shopping and social centers where posters were displayed; specimen metric weighing instruments were taken around in mobile vans by Inspectors of Weights and Measures who conducted demonstrations on the use of such equipment.

IMPLEMENTATION:

Metrication in Kenya, as in the other East African countries, was mandatory, not voluntary, since resistance by the public at large to change is too strong for a voluntary change. An Act of Parliament, the Metric System Act, was passed in Kenya in 1968, and the program commenced at the beginning of the following year.

Section 2 of this Act reads as follows:

"2 (1) The Minister may, by order, specify any area, industry, trade or transaction in which all weighing and measuring instruments possessed or used by way of trade indicating in units other than metric units shall be converted to indicate in metric units within such period and in such circumstances as he may think fit.

"2 (2) When an order is made under subsection (1) of this section, the Minister may, by the same or a subsequent order, prescribe a date after which the possession or use by way of trade in the area, industry, trade or transaction concerned of any weighing or measuring instrument which indicates in units other than metric units shall be prohibited."

COMMERCIAL SECTOR:

The first sector to metricate was the commercial sector which was given priority on the grounds that it was this sector where the entire population was involved in commercial activity of some sort, either as buyers or sellers or both at the same time. In this sector, a beginning was made in such areas of the country where commercial activity was concentrated. The conversion was undertaken on trade-by-trade basis to avoid unfair competition between retailers who had metricated and those who were still using the imperial units. In rural areas where small trading centers could be covered within a short period, it was considered convenient to declare a given geographical area "metric" as the question of unfair competition did not arise. During the change, the use of old beam scales or counter machines was permitted after their capacity was physically converted

to the corresponding rational metric capacity. In such cases, all that a trader needed was a new set of metric weights while the old imperial weights were surrendered to the Inspector of Weights and Measures who was going around with licensed weighing machine repairers on publicized metrication trips throughout the country. In the case of platform machines and other weighing instruments, steps were taken to ensure that steelyards, counterpoise weights (proportional weights), or dials were replaced while the capacity was physically converted to metric units. New weighing instruments were required to indicate in metric units although those indicating in both metric and imperial units were allowed during the transitional period.

PREPACKED GOODS

As the general public was immediately made aware of the metric change through the purchase of metric goods in retail shops, action was taken to insure that consumers did not suffer through fraudulent transactions as a result of the change. Thus, apart from replacing imperial weights and measures, the principle of rationalization was applied to certain prepacked goods intended for sale in order to make it possible for prospective purchasers to make a ready assessment of the quantities and relative values of similar goods in different packages. New rules intended to control the packing and sale of prepacked goods were therefore made. The Weights and Measures (Sale and Labeling of Goods) Rules were gazetted in 1971 after extensive discussions which the Standing Committee on metrication held with the packaging industry and manufacturers of the various goods. On-the-spot studies of the machinery used for packaging and a scientific assessment of the behavior of commodities under varying conditions of temperature, pressure, and relative humidity were also undertaken by the Committee when the Rules were being drafted.

The Rules specified goods to be sold by weight, weight or number, measure of capacity, weight or measure of capacity, and those to be sold by weight or linear measure. Some 55 items which had to be packed in standard specified quantities were also listed in a Schedule to these Rules. The Rules also made provisions for prepacked goods to be marked with a statement of quantities of the goods contained therein.

THE OIL INDUSTRY:

A four-year program (1969-72) was planned for the changeover in the oil industry. Here the program involved the conversion of all dispensing pumps at retail and consumer outlets using conversion kits received from overseas manufacturers. Although pumps installed at customers' premises such as factories and farms were not subject to mandatory change since they were not in use for trade, the oil companies voluntarily converted the pumps in the interest of the customers. Apart from service stations, there were bulk distribution lorries and flowmeters at airfields and depots which were all

converted to indicate in metric units within the period set for the industry.

PHARMACY AND MEDICINE:

Prior to metrication it was common for prescriptions to be written in a mixture of apothecaries and avoirdupois units or metric and avoirdupois units. During the changeover, it was decided to rationalize doses, and prescriptions were to be written in metric units only. Subsidiary legislation requiring all dealings in drugs to be conducted in the metric system was brought into operation. A series of tables incorporated in the legislation showed the equivalents of metric weights and volumes. Standard doses of 5 mL were introduced for most prescriptions. Special 5 mL spoons or multiples thereof for measuring doses of medicine were issued to patients.

OTHER SECTORS:

Metrication in other sectors such as transport and communications, customs tariff and trade statistics, agriculture, survey and maps, and forestry and timber was also tackled at the same time that the commercial sector was being metricated. In education it was imperative that the education service in the country assume the responsibility for the changeover in schools and colleges mainly because it was recognized that through indirect contacts with parents, pupils would play a vital part in helping adults to become more conversant with the new system.

For the purpose of coordination, the overall responsibility for the changeover in education was left with the East African Examinations Council. The Council's concern was to ensure a coordinated approach towards the conversion of the examinations into metric terms and to provide guidance to teachers, students, and examiners.

CONCLUSION:

It cannot be claimed that the metrication program in Kenya has been completed. Although the commercial sector was the first to change, there are still some problems in connection with the verification of weighing and measuring equipment. While metrication in this sector is complete, the rules governing the verification and stamping of trade equipment have not been revised to reflect the changeover. Errors applicable to weighing equipment are still indicated in the imperial units. The revision of the rules has taken some time since there is a need to coordinate such legislation with international practices, in particular the recommendations of the International Organization of Legal Metrology.

Furthermore, despite the fact that legislation was enacted from the beginning for the purpose of the changeover, imperial units are still legally recognized until such time that the Weights and Measures Act

is amended to abolish them. This Act still requires that verification of the Kenya Primary Reference Standards be carried out in the U.K. by reference to the United Kingdom Standards. Metrication in other fields such as the engineering and building industries has been much slower and will take many years to complete. The effective metrication in these fields needs two basic elements--provision of metric standards and the introduction of the concept of dimensional coordination. Now that a Kenya Bureau of Standards has been set up and is now operational, it is hoped that the metrication in the engineering and construction industries will be speeded up.

PROBLEMS OF WEIGHTS AND
MEASURES IN KOREA

by

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The metrology system of weights and measures is most basic in our daily lives. It is essential for establishing economic order in the fair purchase of goods all over the world. This requires worldwide study and coordination of unified, ethical laws and regulations.

In Korea, we are dedicated to making such standards of weights and measures generally used and to make them the instruments for promotion of our economic development and cultural advancement. The National Weights and Measures Law has been established and is contributing to the scientific, technical, and economic benefit of our country.

Standard weights and measures practices are being applied not only to attainment of assured measurement in the marketplace, but they are also becoming the standard practice for general calculation, such as is encountered daily in education, science, engineering, industry, and the economy in general.

Such practices must be standard not only in our individual countries but in the worldwide trade activities, in exchange of technical information, and in promoting the integrity of all such interactions.

International metrology cooperation brought about the Treaty of the Meter which has led subsequently to accepted international standards based on the metric system of units. Success of this effort encourages acceptance by most countries.

Korea joined the group of nations which were signatories to the Treaty of the Meter 18 years ago in July 1959. Following announcement of our new weights and measures law in 1961, we prohibited the using of the yard and pound units subsequent to 1964. Unfortunately, prohibited units are still being used. For example, "sukk" is used as a measure of rice; inch is used to designate shirt dimensions. At the same time, sugar is measured in kilograms and wine in liters.

We are far from full acceptance of metric units only.

A program must be instituted nationwide to bring the message to everyone about the importance of accepting the metric system of measurement. This program must be through the mass media, pamphlets, and educational promotion. Our people must become familiar with the international trends and the negative impact of those trends on our export-import activities if we, in fact, do not convert.

Whereas standard weights and measures were necessary for our commercial trade internally, our economy has now grown internationally. Therefore, our weights and measures laws and regulations must be changed to serve international trade requirements in addition to the internal marketplace requirements.

A new weights and measures law is needed in Korea for enforcement officials to protect consumers, promote ethical trade, and prevent fraud through inaccurate or improperly used measuring devices.

A first need among the governmental activities is the inspection and certification of measurement devices to insure technical performability of such devices. Additionally, subsequent inspection extends that protection into everyday trade activities.

Newly manufactured scales are thoroughly calibrated. The Government checks many of them and rejects those not meeting certain standards. Rejections average 6 to 7 per cent.

Second, scales in commercial use must be inspected at least yearly, and those suspected of being out of calibration or being used fraudulently are inspected more often. Defective scales are found in about 15 per cent of those inspected.

Higher rates of defects than found in more advanced countries are due to the lack of adequate quality control and related guarantees by domestic device manufacturers. Our industry is still small and tends to be employing less modern manufacturing methods than other countries. It is necessary to modernize and extend modern services and technical guidance for quality control. We need to work closer with foreign countries to work toward similar quality standards.

A systematic development program must be established with the goal of advancing our capabilities in weights and measures technology to bring us in equality with sophistication of advanced nations. Efforts invested in inspection of devices must be reduced to a minimum by making it possible for the manufacturer to produce and guarantee a better product. The Government would only need to conduct random inspections thereafter, concentrating on illegal activities or advancement of technology itself.

Third, we must examine our inspection activities to determine if we are checking the correct items at the correct places in order to insure equity and fairness to the consumer.

Fourth, proper, logically written laws must be written to punish those responsible for such things as misrepresentation of products and illegal or fraudulent labeling, whether we are talking about groceries, building materials, petroleum products; or any commodity in commercial trade.

One big problem making any inspection program difficult is our lack of adequate staff to inspect and follow through on punishment in such a way as to alert those who cheat. Much of the job depends on self-help and involvement of the consumer himself. The consumer must, therefore, be educated and encouraged to make better buying decisions.

In the future, we will be going to controlled packaging practices utilizing automatic digital scales producing labels displaying accurate weight and prices which are visible and simple--therefore, easy to understand.

This new practice is only one of the steps being taken in our country. We plan similar approaches in dealing with precision machining, automatic control systems, and precision finishing in industry and defense. We must increasingly develop precision control in our heavy industry and chemical processes. This will be necessary to support national goals toward industrialization and international trade.

Development of modern weights and measures technology and management of that capability is the foundation of our product quality and key to our moving ahead in national technical development.

THE NEED FOR TRAINING OF PERSONNEL

by

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One of the most acute problems which offices of legal metrology in developing countries now face is the lack of technical staff of high and middle level. The economic development in these countries involves a need for an increasing number of such staff. So there is severe competition between different sectors of the economy for the recruitment of such personnel because of very significant differences in the salaries offered. The competition increases with the level of the training.

Staff members trained in offices of legal metrology leave it for other sectors. Movement of personnel in the opposite direction is negligible; so there is a continuing need of training of new personnel for replacement of staff that has left.

The complexity of the different types of instruments which have to be checked by this staff makes a continual updating of knowledge necessary. Shortage of staff makes it necessary for each member to be able to check a significant number of types of instruments. Thus, the need of training is increasing more and more.

Thus, the problems we have to solve in this field are:

- 1) Shortage of technical personnel.
- 2) Competition for trained staff with the other sectors of the national economy.
- 3) Staff training.
- 4) Updating of knowledge.

The training courses have to be frequent and must accommodate a great number of personnel.

To solve partly the first problem, the recruitment is directed to candidates with scientific and technical training but without specialization because such candidates are more numerous than others and because it is possible to stabilize them with an appropriate policy of training and promotion.

From Morocco, this training is now being provided by some specialized foreign schools for medium- and high-level technicians. However, the number of trainees who can be accepted is still limited in comparison with the potential needs. Thus, the programs of training have somehow

to be adapted. Training of lower level technicians is being provided inside the country; it aims to improve their theoretical and technical knowledge to enable them to be promoted to upper grades. By these means, this kind of staff also can be stabilized. Another method is to permit participation of personnel in a part of the fees collected for some types of checks.

These means are considered effective but inadequate for the importance of the problem in developing countries. A wide-ranging international cooperation is apparently needed.

So the International Organization of Legal Metrology (OIML) is interested in this subject as one of importance. An international reporting secretariat now exists inside its Pilot Secretariat 25 which is responsible for the problems of developing countries in the field of training, regulations, and equipment.

The tasks of the reporting secretariat on training of which Morocco is responsible are:

- 1) Defining of the requirements for basic training and refresher courses at various levels.
- 2) Specifying the content of the training courses.
- 3) Defining the methods and means for the above.
- 4) Surveying the possibilities for cooperation in developing texts, courses, and audio-visual materials.
- 5) Assuring that courses and seminars take place within reasonable periods of time.

In close cooperation with the Bureau of OIML, a survey has been made to ascertain how many OIML member-countries are ready to take part in the work of this Secretariat and how they can contribute to its functions. The main points of the questionnaire circulated were:

- 1) What are the needs of developing countries in the field of training?
- 2) What are the details of the programs of basic training and refresher courses required, and what are the methods and means of training?
- 3) Which countries are capable of supplying assistance?
- 4) How can an international training center be set up?
- 5) Which countries can assume the responsibility for organizing basic training courses or refresher courses?

- 6) Which countries can supply or participate in developing educational materials, courses or books, audio-visual materials, and so on?

The results of this survey are very encouraging. At this time, two documents on training programs are being circulated, and two seminars are now being prepared with the assistance of UNESCO.

However, we can say for certain that these actions may not have a fully satisfying effect for some years. The private sector appeal for technicians will continue to increase. Therefore, it is urgent to give training increasing importance, because we feel we had better satisfy the needs of all sectors of the economy and try to serve wider national metrological systems.

From this point of view, the evolution in developed countries toward decentralization of regulatory control from national offices of metrology to semi-public or private laboratories under the control of the state is now observed from our countries with great interest. This development, after an appropriate study, could be helpful to resolve partly the problem of staff in some limited fields of applied metrology.

We feel that the development of training in metrology in as numerous fields as possible with the important assistance of developed countries inside the OIML and other international organizations would be a fruitful means to develop metrological services in our countries.

In the long run, evolution toward modified ways of obtaining assurance of legal metrological checks and adoption of the different measures mentioned in this paper would be extremely useful for the solution of the problems which now confront the offices of developing countries.

THE PROBLEM OF WEIGHTS AND MEASURES
IN PANAMA

by

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Panama is a small country with an area of 77,000 km² and a population of approximately 17,000,000 people this year. It is situated in the Central-American Isthmus, contiguous at the east with Costa Rica and at the west with Colombia.

The Panamanian is a mixture of races composed of Indians, native inhabitants of this American region; Spaniards who came to these lands adventuring and conquering; Chinese brought here by the French when the construction of the French Channel started so that they would work in the building of the transisthmian railroad; black Africans brought later on by the Panama Canal Company when the construction on the canal was handed to the United States of America for its continuation; and a series of other minor ethnical groups like the Hindus, Greeks, Italians, Jews, and other Europeans.

So the Panamanian is a very singular man that has adapted himself to the circumstances of the environment, assimilating much of the customs of each of the races, which little by little also integrated to the mixture that is the Panamanian.

It is probably because of this situation that our people have been very receptive and flexible and have learned how to adjust themselves to the circumstances in every moment.

In 1853 when we were still part of Colombia, there are references to the use of the metric system in the Isthmus because mostly all our relations as part of Colombia came from the Old Continent. When we obtained our independence in 1903, we broke many of our old bonds and started to develop the new republic keeping close relations with new countries, especially the United States of America, who was then building the Panama Canal.

In some of the codes of laws of Panama's Legislation, dated from 1917, like the civil code, fiscal, labor, commercial, administrative, and rural, there are mentions of metric units of mass and volume but they are very scattered. There is not one unique body of laws which refers to weights and measures. These few items cannot be considered in any way as metrological legislation.

The only exceptions appear in the administrative code where authority is conferred on the municipalities to seal the weights, which is a typical disposition of legal metrology, and a law through which the Office of Price Regulation was created in 1969 where it established that this department will have the authority to "verify the accurateness of weights and measures and sanction those who alter them" confirming also that "the alteration of weights and measures shall be considered as an alteration of prices and the violator shall be worthy of the sanctions imposed."

This department, the Office of Price Regulation, which is responsible for the custody and use of the instruments of weighing and measuring and also occupies itself with verifying the net content of prepacked commodities which are sold by retail stores, does not really have in use official regulations with which to execute these tasks.

The work it does is limited to verifying some types of scales of commercial use, checking gasoline pumps, and controlling those prepacked commodities that present problems and which are reported by the consumer. All these controls are done in units of the English system.

This limited range of work that this office does results from the lack of adequate personnel for the job, lack of equipment, and mostly from the little importance that up to now had been given to the metrological needs in our country. On the other hand, the use of the metric system in the everyday activities of commerce is seldom used, only in cases like certain equivalents stamped on the container of food products. All the products that are sold without prepacking are weighed in pounds or its volume is determined in fluid ounces, and in the case of units of length, the yard is used. The use of the English system is general.

After 1970, the industry sector started to develop rapidly when a construction boom occurred due to a favorable economical situation which a few years later decreased. Industry in Panama is composed mostly of small companies dedicated to the manufacturing activity, principally the processing of food products, alcoholic and non-alcoholic beverages, dressmaking, footwear, sawmills, and workshops for woodworking. For the most part, the raw materials utilized in these industries are imported, a high percentage of them from the United States of America, including the equipment for industrial processes. The rest comes from Japan, Germany, Italy, or Spain.

Due to this situation, in some industries both systems of units are being used in one production process. In the educational area, the English and metric systems have always been taught. In practice, the English system has been mostly used.

In synthesis, the general view is of a country where because of historical reasons, fundamentally derived from the commercial

interchange with the United States of America, and because of the very particular geographical conditions that make of Panama a point of obliged transit for commercial currents from all the world, weak legislation on metrological affairs like the one we have is generally ignored.

In view of the situation here described, the Panamanian Commission for Technical and Industrial Standards, a department which belongs to the Ministry of Trade and Industries, started to develop a Metrology Program for Panama in 1974 through joint projects with the Organization of American States (OAS) and the United Nations Development Program (UNDP).

With the financial support of these two organizations, it has been possible to obtain international technical assistance, training of personnel in recognized metrological institutions of Latin America, adequate equipment, contracting of personnel, and books. On the other hand, the national government has assigned a special fund of the Annual Budget for Investments with the purpose of giving the Program a greater impulse and has stated its unconditional support for its better execution in all the country. The Metrology Program for Panama, which was developed jointly by COPANIT and international experts who have assisted it, covers the following objectives:

- 1) To establish a base of measurements for the country that will function as a Laboratory of Metrology.
- 2) To develop a law draft and its respective regulations that will establish the legal standards and give administrative faculties to impose them.
- 3) To obtain from the public powers the promulgation of the law and to apply it with energy.

In 1974 COPANIT started, together with the help of OAS and UNDP, the creation of the Official Laboratory of Metrology whose functions are those of being the national basis of measurement besides assisting the standardization and quality control activities that are also part of COPANIT's task, through the fulfillment of metrological services.

The actual situation in Panama with respect to instruments and techniques of measuring is very poor basically because our manufacturing industry is not a producer of equipment. On the contrary, we import all equipment for industrial, commercial, and domestic use.

For this reason, metrological control can best be assured by checking the quality of the imported instruments, be it so, through the tradesmen, producers, importers, merchants, sellers, etc.

Industrial metrology which is dedicated to the calibration, certification, and technical measurement of industrial types of equipment assures through its control that the final product conforms to the quality specifications established in the standards, but does not directly protect the citizens from harm due to inexact or false measurement which could happen in the field. For this reason, the metrological controls executed by the State should apply to the measuring instruments used in areas like public health, commercial transactions, postal and attorney affairs, and judicial appraisals, and to any other instrument that the State designates that because of its function should be regulated.

Thus, we see the urgent need to develop together, but at a faster speed, legal metrology under the structure of our Metrology Program, which was not contemplated initially.

In this Program, scientific metrology has also been contemplated but only in what concerns the conservation and custody of the standards and probably some investigations. Standardization has also been taken into account. The personnel of the laboratory will be in charge of the elaboration of the specifications for measuring instruments.

The Metrology Law draft is now in its stage of discussion with the private and public sectors, to be later proposed to the Legislative Branches respectively. The Law includes a series of regulations which include the establishment of final dates in each sector for the definite change to the International System of Units (SI). The general outlines of this law refer to the application of the SI Units, the national standards, measuring instruments, ways of application, prohibitions and sanctions, and the regulations of all those particular aspects which require more explanation.

Together with law, a Program for the change to SI Units has been developed in which there are three major areas to coordinate the adoption. These are the industrial, commercial, and the public areas that are different with respect to the way they are organized to orientate their work, the people that execute it, and the goals.

The Metrology Law is not compulsory nor prohibitive; it regulates and makes uniform in the country measurements which had not before been subject to national regulation. It also helps to obtain the objectives fixed in the National Plan of Development for Panama in matters of substitution of importations, increasing of exportations, and to better the national product.

In order to be able to obtain an effective increase in the exported goods, it is necessary to have a national product of better quality which we will only be able to get through more precise and exact measurements.

With the world's inclination to unite the measurement systems and to adopt universally the International System of Units, it is necessary that our country join this world current, even more if we consider that we are a young and small country that is still in process of development.

WEIGHTS AND MEASURES IN THE PHILIPPINES

by

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The Philippines is now in the fifth year of metrication. Metrication, which is one of the most significant innovations in our new society, involves changes which greatly affect the life of every Filipino.

Historically, the Filipinos started out with native units of measurement like the varra, picul, dipa, and cavan. The English system was introduced during the Spanish regime, and it became dominant in the country. However, during this period, some metric units started to be used. The metric system was officially adopted in the Philippines in 1906 by the Second Philippine Commission. The then Bureau of Science (now National Institute of Science and Technology) was authorized to maintain the "meter" and the "gram" as the standards of units of measurement. A meter bar certified by the International Bureau of Weights and Measures (BIPM) with Serial No. 71 and calibrated at 999.9862 mm had been procured. This "meter" has not been calibrated since then.

Although the metric system was the official standard of weights and measures in the Philippines, the concurrent use of English and indigenous units of measurement was also allowed by the law.

This admixture of several legal measurement systems resulted in a complicated situation in the economy, especially in the agricultural, manufacturing services, and trade sectors. The Filipinos, especially the consumers, find it confusing and difficult to determine which products are cheaper to buy.

Presidential Decree No. 187

To eliminate confusion and to promote domestic and foreign trade, President Marcos issued on May 10, 1973, Presidential Decree No. 187 (P.D. 187) prescribing that the metric system is the sole standard of weights and measures for all products, commodities, materials, utilities, services, and in all business and legal transactions in the Philippines effective January 1, 1975. P.D. 187 was amended by P.D. 748 extending the metrication period to January 1, 1977.

Metric System Board

In order to effect the orderly change to the metric system, the Metric System Board was created with the Secretary of Trade as Chairman, the

different department secretaries as members and the Director of the Philippines Bureau of Standards as the Executive Secretary. The functions of the Metric System Board are as follows:

- a) Cause the conversion of existing measures to their equivalent in the metric system.
- b) Draw up a program for the nationwide use of the metric system.
- c) Promulgate rules and regulations.
- d) Disseminate information on the metric system.

A major accomplishment of the Metric System Board and the Philippines Bureau of Standards is the preparation of various information materials such as the Definition of the SI Units, Conversion Factors and Tables, Rules for Style and Usage of SI and Related Units, Common Uses of the SI Units, and others.

Philippines Bureau of Standards

Standard specifications have also been prescribed for the local manufacture of commercial metric weights and measures like weighing scales, steel scales for engineers, tape measures, etc. The Philippines Bureau of Standards, being the national standardizing body, undertakes the standardization of different products including measuring instruments, measuring methods, and also the inspection of the instruments. To date, the Philippines Bureau of Standards has formulated a total of 21 documentary standards for various measuring instruments and practices.

The Philippines Bureau of Standards in enforcing the standards on different measuring instruments avails itself of the testing facilities of the National Institute of Science and Technology and other government agencies including private institutions. Its present laboratory undertakes only quality evaluation of various products, mostly consumer items.

National Institute of Science and Technology

A Presidential Decree on Legal and Scientific Metrology has also been drafted. In this decree, the National Institute of Science and Technology (NIST) will be the official custodian of the national standards or prototypes except National Time which will be maintained by the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA).

At present, NIST maintains the national standards for mass, length, temperature, volume electricity, and light intensity. With these national standards, NIST conducts calibration services for both private and government sectors.

The following tabulation will show the accomplishment of NIST along this category of services in 1977:

Weights and Measures

Vehicle tanks	529
Seraphin measures	277
Test weights.	1,294
Weighing scales	130
Tape measures	8
Proving tanks	16
Trailer tanks	24
Bullet tank	1
bulk tainer tanks.	<u>290</u>
TOTAL	2,569

Moisture Meter Unit

This unit calibrated moisture meter units for various purposes and derived an income of ₱21,821.15.

Government and Private Agencies with Metrological Laboratories

The Bureau of Internal Revenue is presently charged with the responsibility of inspecting, sealing, and licensing of weights and measures used in trade and commerce. The Internal Revenue agents, in coordination with the city or provincial treasurers, are responsible for the inspection and proper testing of all commercial weights and measures in the city and provinces. The receipt for the fee charged for the sealing of weights and measures serves as the license to use such instrument from the date of sealing. The inspectors or sealers may destroy any defective instrument of weights and measures if its defect is such that it affects its serviceability.

The Philippine Air Force maintains a Precision Measurement Equipment Laboratory (PMEL) which performs calibration and repair services of aeronautical instruments and equipment. This laboratory maintains close liaison with Clark Air Force Base (U.S.A.), the latter providing backup service and standards traceable to the United States of America.

The Civil Aeronautics Administration (CAA) maintains a well-equipped laboratory for testing and calibration of aircraft instruments and equipment. CAA works in close collaboration with the Philippine Airlines which maintains a similar laboratory.

The Metals Industry Research and Development Center has inspection and dimensional laboratories as well as an instrumentation shop for the

repair and calibration of instruments such as optical pyrometers, temperature indicators, and recorders.

Within the private sector, testing facilities generally are found in such large industrial and commercial companies as automobile assembly plants, steel mills, textile mills, electric power plants, and telephone and radio communications systems. Often these companies are affiliated with parent organizations in highly developed countries. A common pattern appears to be one in which the parent organization has transferred its technology to the affiliate in the Philippines, including the establishment of quality control and testing laboratories.

The facilities of the above-mentioned agencies are still inadequate to afford proper supervision over the different measuring instruments used in the Philippines.

Conclusion

With the advancement of the science of measurement, we feel it extremely important in the Philippines to undertake studies in such highly developed countries like the United States of America, Switzerland, Japan, etc. These studies, plus all the cooperation we hope to have from international organizations and friendly nations, would help us greatly in reaching our goals in time.

DIFFICULTIES OF A DEVELOPING COUNTRY
TO ESTABLISH A WEIGHTS AND MEASURES SERVICE

by

Mr. Ahmed Mohamed Babiker
Director, Weights and Measures Administration
Ministry of Commerce and Supply
Khartoum, Sudan

Here I shall try to speak about difficulties generally faced by most of the developing countries. I shall not confine my paper to the particular obstacles we have faced in our country.

Our first problem was to obtain the know-how, the knowledge of how to establish and how to run a weights and measures service. Most of the developing countries had previously been colonies of some European country. They, therefore, solved the problem of getting the necessary information in the same way--from the colonizing countries. Our country, being a previous British colony, had asked the British to help in the field of establishing a weights and measures service. Britain sent two of their experts to train the Sudanese and to start the work. Their job was as follows:

- a) Technical training of the staff.
- b) Drafting the law and regulations.
- c) Formulating the administrative side of the work.

They started about 26 years ago and finished their job in 1955. While they were on that job, they sent two graduates of mathematics and physics to be trained practically and theoretically in Britain. One of them succeeded in obtaining the Board of Trade certificates for appointment as a weights and measures inspector.

Thanks to the British, we did obtain our first necessary information from them. But the amount of knowledge we now need is much more than we have been given. We now know how to test conventional weighing and measuring instruments, how to adjust them, how to compare and adjust standard weights on sensitive balances, etc., but the weighing and measuring technologies have developed much faster than the development of our knowledge about them. We read about the development of weights and measures, but it is not enough to read literature in order to be able to test and adjust any machine. Practical and theoretical training must go side by side. It would be very embarrassing to us if a trader in the Sudan introduced an electronic machine and submitted it to our administration for verification and stamping. Even the Director of Weights and Measures does not know much about many advanced instruments.

A man brought up in a developed country like yours may think that lack of knowledge is our only problem. In fact, that is not true. Lack of knowledge is our simplest problem. Knowledge can be obtained after full training in a developed country for a few years. That problem is thus solved for some time to come. Those of you who have traveled to our countries have recognized our main difficulties which are caused by two factors: (a) social and (b) financial.

Even in the United States or Britain the social factors stand as obstacles to metrication, for example, but they are conquerable obstacles. It is not difficult to convince your citizens that metrication is an international trend which you cannot resist. In a developing country where illiteracy is predominant, it is not easy to do that. You cannot talk to the man in the street about keeping pace with an international trend. Even the presence of the weights and measures service, in principle, was questioned. In the fifties when our service was established, people used to look at it as a plot of the imperialists who want to waste our money on unnecessary services. These days we are preparing ourselves for a new fight with our own public opinion when we announce our plans for metrication.

In spite of what I have been saying above, I think that the social resistance to change can be overcome either by convincing or compelling the people. But who can convince our pockets to overcome the financial difficulties? Mr. Peiser's mission to survey the standardization and measurement services in our country, thanks to Mr. Tholen, resulted in a recommendation for some equipment which they think of the utmost importance to our weights and measures laboratory. This may cost a few hundred thousand Sudanese pounds. In your country all you may need is to put the cost in your proposals for the coming budget, and within one year you can acquire what you have been lacking. To our limited resources, a sum of a few thousand may mean a lot. Because of the limited resources, a complicated system of application for financial approvals has to be followed for any government expenditure, and my delay in coming to this conference is a real-life example.

Unfortunately, we have a minor problem originating from the more developed countries. You know that only about 10 percent of our need for trade appliances of weights and measures are manufactured locally, and we have to import the remaining 90 percent. It is in this field that we have discovered some attempts by foreign producers to deceive our local importers. Usually when a manufacturer thinks of exporting his machines to the United States, to Germany, to France, or to Britain, he has to obtain a copy of the regulations of that country and try to make his products conform to those regulations. But, to my surprise, I encountered in my country some imported weighing machines which would not pass even preliminary tests, and I had to order them to be reexported. To safeguard against such cases, we had to change our system of pattern approval. Usually, in most countries when a new type of weighing or measuring instrument is to be

introduced for use in trade, one example of that type of instrument is submitted for examination and approval. According to our practice, we test even the conventional and well-known types when they are to be introduced by a new importer or producer. In one case, I had to reject a platform machine with a steelyard, and I stopped the import of that type of machine from the country concerned.

The main aim of a weights and measures service is the protection of both buyer and seller, but the buyer is in most cases more vulnerable to fraud. No doubt, therefore, our protection must be directed to the weaker side. Again, in developed countries the consumer especially is more aware that he is sometimes defrauded than is the public in the less developed regions of the world. In the developing countries, control on legal metrology has to be intensified so as to protect the illiterate consumer who is in most cases defrauded.

Although we are convinced that our public stands in greater need of protection, it is the social, financial, and other factors already mentioned, which at the same time are more severe obstacles to our giving that important and necessary protection.

REPORT ON SUMMARY AND EVALUATION SESSION

by Mr. H. S. Peiser

The session was attended by:

Participants -- Mr. R. Aguirre
Mr. P. A. Ayata
Dr. A. Braun Bidau
Mr. S. M. Choi
Miss C. D. Herrera
Mr. A. Kilani
Mr. T. Mitchell
Mrs. I. Ruiz de Suarez
Mr. Santosa

NBS Staff -- Dr. E. L. Brady
Mrs. P. M. Odar
Mr. H. S. Peiser
Mr. C. C. Raley
Dr. R. C. Sangster

Mr. A. M. Babiker and Mr. M. Benkirane unfortunately had to leave prior to this session. After a brief introduction by myself on the purpose and extent of NBS projects in support of less industrialized regions, all present took part in a very lively debate on the outcome of this training course. Everyone agreed the course filled a need and should be repeated. In fact, I had some difficulty in emphasizing that the course was an experimental one and similar courses were not at present planned. A decision to repeat such a course depended to a large extent on the views and experiences of the participants. The more they saw a benefit, the more we at NBS wanted to hear their constructive criticism on how we could make a good course better if repeated. In this way, we did hear some such suggestions, but I was told on more than one occasion that if I recorded these remarks I should emphasize the overwhelming positive reactions--everyone appreciated the course--the presentations had been well made--everyone learned--everyone imparted experience to the hosts and other participants to the direct benefit of the counterpart programs in all countries--everyone felt warmly towards the hosts and other participants--and everyone thought it was a unique opportunity of mixing with others from places geographically removed from their own countries, yet with similar responsibilities and opportunities.

The following suggestions were made to help in the organization of a possible future training course on weights and measures:

1. Plan the program in more detail to prevent overlap, for example, and repetitious presentations. In addition, pre-circulate an explanation of how an individual chooses the sessions of greatest interest to himself in a big U.S.-style national conference. After a while, the voting sessions became tedious to our visitors.
2. Announce these plans to the participants well in advance so that they can be better prepared and can indicate areas of special interest.
3. Site visits to one or two instrument manufacturers should have been included, but if so, I wondered why then was the conference exhibit not well attended by the participants of the course?
4. Some time should have been devoted to participants presenting their own views to colleagues. In this connection, I indicated our appreciation for the participants' reports which I had read with great interest and which, subject to the individual copyright releases, will form a major part of the report of the course.
5. Type approvals should have been discussed.
6. More NBS laboratories should have been visited and higher level calibrations explained.
7. The hardships of living under U.S. Travel Regulations for strangers in a luxury hotel should not be underestimated. Advance indication of the problem would, in some instances, make it possible for their own institutes or governments to subsidize their stay by some additional allowance.
8. More comfortable transportation arrangements in one or two places would have been appreciated.

We will arrange for the Conference Proceedings to be sent to all participants. Dr. Brady discussed the possible relevance of this type of training to initiatives to be advanced to the U.N. Conference of Science and Development and was assured of considerable interest by participating countries.

When Dr. T. A. Dillon, Deputy Director, joined the group, he presented the plaques commemorating individual memberships in the National Conference on Weights and Measures. Mr. R. S. Walleigh, former NBS Deputy Director, also joined the closing party.

I feel fully authorized on behalf of all participants to express to Mr. A. D. Tholen, Chief of the NBS Office of Weights and Measures, and to Mr. H. F. Wollin, Secretary of the National Conference on Weights

and Measures, profound and lasting gratitude to themselves and their colleagues who made this course possible. I was further requested to express to the Agency for International Development the participants' appreciation and to Mr. Tholen the hope that he will pass on this warm appreciation to Mr. W. F. Junkins and Mr. J. F. Lyles and their colleagues.

EVALUATION OF THE NBS/AID COURSE
ON WEIGHTS AND MEASURES, 1978

A. RELEVANCE TO YOUR PROGRAMS IN YOUR COUNTRY

Question

1. What portion of the presentations had any relevance to your

a. present needs?

Among the items listed as relevant to present needs were:

- relation of NBS to State weights and measures offices
- NBS Handbooks 44 and 67
- metrication
- checkweighing prepackaged commodities
- testing gas pumps
- checking truck scales
- new types of weighing and measuring machines

b. future needs?

Among the items listed as relevant to future needs were:

- innovative equipment used in weights and measures
- training for weights and measures personnel
- inspection of electronic digital scales and meters
- testing of LPC meters and vehicle tank meters
- inspection of distance measuring devices

Question

2. Which presentations could have been omitted

a. in Gaithersburg?

It was unanimously stated that nothing could have been omitted.

b. and c. in Harrisburg and Richmond?

It was generally believed that nothing should have been omitted although some duplication could have been avoided.

d. at the National Conference on Weights and Measures?

Several of the participants thought the voting sessions could have been missed. One participant would like to have had guidance in choosing the most valuable of the many presentations.

Question

3. Which presentations could have been expanded

a. in Gaithersburg?

Items mentioned included high precision instrumentation, observing the seven base unit standards, the OWM Prototype Program, observation of test procedures, and visits to more NBS laboratories.

b. in Harrisburg?

Three items were mentioned, namely: visiting a scale manufacturer, testing of prepackaged commodities requiring drainage, and routine gas pump examination.

c. in Richmond?

Four items were noted: more field inspections in packaging factories, determination of aerosol net weight, testing of LPG meter and a bulk plant meter, and laboratory work.

d. at the National Conference on Weights and Measures?

One participant felt there should have been a paper on the problems of metrication.

Question

4. Which presentation was most valuable for you

a. in Gaithersburg?

Listed were: the metrology laboratory building, the large capacity precision balance, and the talks on "Weights and Measures in the U.S.A.," "Interesting Engineering Projects," "OWM Standards and Laboratory Program," and "OWM Prototype Program."

b. in Harrisburg?

Listed were: testing of motor truck scales, the retail market inspection tour, and the dairy inspection.

c. in Richmond?

Listed were: testing of an LPG meter, vehicle tank meter, bulk plant meter, electronic weighing and labeling, random weight package checking, testing of train and truck scales, and metrology laboratory presentation.

d. at the National Conference on Weights and Measures?

Listed were: committee reports, final reports, voting, program evaluation and cost-benefit performance auditing, measurement assurance, and the effect of electromagnetic interference on measuring instruments.

Question

5. What presentations could have been added?

Mentioned were type approval programs, advanced methods for calibration of standards, tutorials and laboratory sessions, visits to other NBS laboratories, and visits to manufacturers of weighing and measuring equipment.

Question

6. General comments on the overall benefits of this Course to you and your country. (Responses in alphabetic order by country.)

BIDAU: My country is trying to get even with the new procedures in weights and measures, and mainly with testing scales. This is, I believe, the biggest benefit for my country.

AGUIRRE: From a professional point of view, I have increased my knowledge and it will serve to improve the weights and measures program in my country.

SANTOSA: We have seen many things related to weights and measures but, also, to know the way of life of American people and their democratic thinking.

MITCHELL: This course was beneficial to me as it has exposed me to more sophisticated and advanced techniques in the field of weights and measures, and I see Jamaica benefiting if some of these techniques are used there.

AYATA: I found the course to be useful, and I am confident that I have benefited immensely from it. When I get back home, it is my intention to put into practice some of the techniques I have been able to acquire while here, and I am sure that my country will benefit from my having attended this course.

CHOI: I think this course was well prepared and organized. I would say this course was a good experience and I enjoyed it very much. I will practice this course program when I return to my country.

RUIZ DE SUAREZ: This course has given me a broader view of the way legal metrology can be applied and executed according to the needs of my country and what other countries are doing and how this can in turn affect my country, especially in relation to international trade. It has also given me the opportunity to see the latest in techniques and equipment used in this field. I have also made good relations with U.S. people and international people in this field, thereby permitting me to make further contacts for any type of problem that may arise in my country.

HERRERA: This course gave us good ideas which could be applied in the Philippines.

- BABIKER: (1) To know about the administrative side of the U.S.
(2) I could see new inventions in the field of weights and measures. I had heard about them before but not enough.
(3) The contents and procedures of weights and measures laboratories.

Finally, I could see the Space Museum and could see a lot of U.S. history.

B. PERSONAL QUESTIONS

Question

1. Did you

- a. enjoy the Course?

All participants responded "Yes."

- b. regret attending the Course?

All participants responded "No."

Question

2. Did you profit professionally and technically?

All responded "Yes."

Question

3. Do you feel you have established personal and useful contacts with the

- a. NBS staff?

All responses were "Yes."

b. other U.S. colleagues from the States?

All said "Yes" except one who felt the time was too short to do so.

c. other U.S. colleagues from the instrument industry?

All answered "Yes" except one who felt his contacts were not very useful.

d. other Course participants?

All replied "Yes."

Question

4. Do you feel your country should have sent someone else of

a. greater position seniority?

All answered "No."

b. lesser position seniority?

Mixed responses; some said "Yes," others "No."

c. greater technical experience?

All but one replied "No."

d. lesser technical experience?

All but one replied "No."

Question

5. What suggestions would you make for the possible organizational arrangements of future NBS/AID Programs?

BIDAU: (1) That the exact program reach the hands of the person who is coming weeks before the beginning, not when it has already begun.

(2) Try to make larger groups from more countries and be sure that they are of the same level in every sense.

AGUIRRE: (1) To have or to send in advance the entire program to the participants.

(2) A copy of all the speeches should be given to the participants.

- (3) To include visits to industries not only related with weights and measures field.

SANTOSA: This training is all right, but we need also training with more highly technical know-how. What I mean is a longer time course on special matters, e.g., training on cryogenic liquid, deadweight tester, electronic digital display, etc.

- AYATA: (1) Future programs should be prepared in such a way that subjects of more interest to participants should be covered in more detail.
- (2) Participants should also take part in the actual testing of devices, packages, etc.

- RUIZ DE SUAREZ: (1) Advise in advance to AID/NBS candidates what their precise expense funds are going to be so that they can make any arrangements for extra money if considered by them to be needed.
- (2) Schedule the practical visits in the State Offices of Weights and Measures in such a manner that they will not be repeated for the same type of test.

HEPREFA: For me, everything seemed to be all right. The only thing to comment on is the repetition of the activities in Richmond.

BABIKER: More technical information and practical work.

C. OTHER COMMENTS

MITCHELL: I would suggest that future participants be given more subsistence than that received by the participants on this first course. I have been prompted to say this from personal experience and having conversed with the other course participants. In my case, the funds given me were found to be insufficient to cover hotel accommodations, food, laundry, and incidental expenses. I had to resort to a "belt-tightening process" as far as expenditures were concerned in order that my funds were not completely exhausted prematurely.

AYATA: Attendance at the National Conference on Weights and Measures was very valuable and a lot was learned during the proceedings of the Conference. It is, therefore, my view that any future courses of this nature should be arranged to coincide with the National Conference particularly when the Conference is being held in Washington, D.C.

CHOI: My thanks to all the staff members who were concerned with the program, which was well organized and prepared.

RUIZ DE SUAREZ: My sincere congratulations to Mr. S. Peiser and to Mr. C. Raley for the good planning and scheduling of this very interesting course.

BABIKER: The Americans, as I know from this short visit, are very pleasant, humorous, and helpful people. I am extremely impressed by that fact. I offer my thanks to the NBS and the State staff whom I happened to know within these few days.

CONCLUSION

The participants from less industrialized countries reached the following consensus on this experimental weights and measures training course: It is accepted that it is a function of government to assure equity in the marketplace by honest quantity measurements of appropriate accuracy. Representatives of countries that judge their systems of weights and measures surveillance to be in need of improvement find it helpful to observe the ways states of the United States of America fulfill that function. They also learn by observation of the mutual consultation between representatives of the states at the annual meeting of the National Conference on Weights and Measures. (The National Bureau of Standards acts as sponsor and adviser at this annual conference attended by weights and measures officials of every state plus many manufacturers of instruments and other equipment.)

In the weights and measures field, the participants recognize a trend of common problems and opportunities, many of them concerned with prepacking or electronic instrumentation. It is entirely appropriate and beneficial for consultation to take place between countries. The United States should provide a forum for discussion in this field and an opportunity for specialists from other countries to learn from developments in the innovative American retail markets. Such effort by the U.S.A. should in no way interfere with desirable regional cooperation and self-reliant evaluation in each nation of the economic and social benefits of effective and technically sound weights and measures programs.

The participants therefore urge the U.S. Government to repeat such a program for less developed countries on an annual basis.

The Editors

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